mi Sanders

A GEC-MARCONI ELECTRONICS COMPANY

6590

POWER SUPPLY

INSTRUCTION MANUAL

MP MASTER

MA31167

MARCONI INSTRUMENTS LTD
SANDERS DIVISION STEVENAGE

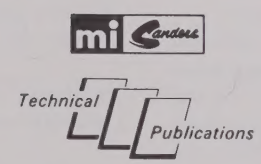
INSTRUCTION MANUAL

for

POWER SUPPLY

TYPE 6590

Department of Electronic
and Radio Engineering



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MARCONI INSTRUMENTS LIMITED
SANDERS DIVISION
STEVENAGE HERTFORDSHIRE ENGLAND

A GEC-MARCONI ELECTRONICS COMPANY

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Chapter 1

General information

Fig.1. Power Supply Type 6590

1.1. GENERAL DESCRIPTION

The Type 6590 is a compact, low voltage general purpose Power Supply which can deliver a stable low ripple dc output voltage over the range 3V to 15V at a current rating of 250mA.

Designed to power the MI-Sanders Type 6061 Gunn Diode Oscillator, the Type 6590 is also suitable for many alternative laboratory or test bench applications.

The front panel carries all of the operating controls in addition to an easy-to-read built-in meter and a BNC output socket.

The meter monitors either output current or voltage, over the ranges 0–250mA or 0–25V, dependent on the setting of a sliding, two-position switch.

A three position lever switch determines the operating state of the instrument. Set to its lowest position it switches off the mains supply. Set to its middle position, it switches on the mains supply and the unit then delivers a level d.c. output, whose amplitude is set between 3V and 15V by means of an adjustable d.c. Volts Control.

When the lever switch is set to its top (⎍⎍) position, the supply delivers a 100% modulated squarewave output, whose amplitude is also varied by the d.c. Volts Control, over the range 3V to 15V. The frequency of this squarewave is varied between 800Hz and 1200Hz by means of the preset Mod. Freq. Control.

A red indicator lamp on the front panel lights when the instrument is switched on.

A folding stand is provided which also serves as a carrying handle. The fuse panel is readily accessible and the mains lead enters at the rear of the instrument.

1.2. SPECIFICATION

Mains Input:	230V or 115V ± 10% 50-60Hz
Output:	3–15V d.c. 50–250mA
Ripple:	Less than 1mV peak to peak
Stability:	For 10% mains variation, 10mV maximum
Meter Accuracy:	± 3%
Metering	
Voltage:	0–25V (d.c. or peak squarewave)
Current:	0–250mA (d.c. or squarewave average)
Modulation:	Squarewave
Amplitude:	100%
Frequency:	1kHz ± 20% Continuously variable (3kHz version available to special order)
Rise and Fall:	Less than 5μs (10–90%) at full output current
Dimensions:	Height 98mm ($3^7/_8$ in)
	Width 203mm (8in)
	Depth 203mm (8in)
Weight	2.15kg (4¾lb)

Chapter 2

Technical description

2.1. TRANSFORMER, RECTIFIER - FILTER

Transformer T1 has two primaries which, by operation of switch SW1, may be connected in parallel for 115V mains input, or in series for 230V mains input. A baulking plate is fitted to prevent accidental movement of this switch. The centre-tapped secondary provides approximately 30-0-30 Volts.

Current from T1 secondary is rectified by MR4 and MR5 and smoothed by C7 and C8. MAINS ON Indicator Lamp ILP1 is energised by one half of this winding.

2.2. REGULATOR REFERENCE AND OSCILLATOR SUPPLY

The voltage across C7 and C8 is unstabilised and only partly smoothed.

VT1, R2 and ZD4 form a constant current source. A complementary arrangement consisting of VT2, R1 and ZD1 provides a second constant current circuit. Interconnection of the two produces an arrangement which exhibits a very high rejection of supply ripple, and consequently a very smooth dc voltage appears at the junction of R3 and R4. This is used as the reference voltage and is approximately 2.5 volts. C1 helps in starting the circuits at switch-on.

The purpose of zener diode ZD2 is to provide approximately 11 volts symmetrically disposed about the emitter of transistor VT8, as h.t. for the Modulator Oscillator.

Regulator

Drive current for the Regulator is established by the constant current arrangement controlled by VT5. Emitter followers VT6 and VT7 provide current amplification. A proportion of the output voltage at the wiper of RV1 is compared with the reference voltage via the long tailed pair VT3 and VT4. Current drawn by VT4 collector is diverted from VT6 since their common source is the constant current supply VT5. Thus the regulator exhibits negative feedback.

Capacitors C3 and C4 are necessary for regulator stability and noise reduction at the output. Diodes MR1 and MR2 are included to reduce turn-off time when the output is modulated.

A current proportional to the ripple voltage across C8 is injected into the regulator loop at the base of VT4 via R8, from the wiper of RV2. Proper adjustment of RV2 will reduce the ripple content in the output voltage to less than 1mV.

Modulator Oscillator

VT8 and VT9, together with their associated resistors, comprise a bi-stable switch, the output of which resets the two constant current circuits controlled by VT11 and VT12. The difference between the currents in VT11 and VT12 charges capacitors C5 and C6. A signal is fed back from these capacitors to the bi-stable switch thus completing a closed oscillatory loop whose period of oscillation is determined by current difference and capacitor size. C5 and C6 may be connected in parallel for 1kHz operation or in series for 3kHz operation. Frequency adjustment is effected by RV3.

During oscillation VT10 is alternately turned 'on' and 'off' thus causing the output from the power supply to rise and fall between zero and the level preset by RV1.

On normal loads the rise and fall times of the output should be less than 5μs. However, on very light loads some deterioration of the fall time will occur. This may be corrected by an additional resistive load across the output if desired.

Meter Circuit

The meter has a resistance of approximately 20Ω and a sensitivity of 1mA f.s.d.

With switch S3 on 'voltage' and SW2 on 'CW' the meter indicates the output voltage directly. When SW2 is changed to 'squarewave', the series impedance to the meter is reduced. This allows the meter to indicate the peak value of the output voltage.

When S3 is on 'current', the meter receives current proportional to the voltage across R26, i.e. it is proportional to the current through VT7. R33 subtracts current from the meter to compensate for that drawn by RV1 and R12. Whether on 'CW' or 'squarewave', the meter indicates average load currents up to 250mA.

Chapter 3

Maintenance

3.1. GENERAL CONSTRUCTION

The Type 6590 Power Supply is contained within a metal case, access being gained by removing the upper two retaining screws at the rear and lifting off the upper cover.

A length of mains lead is provided; Wire colour code is:-

Live	– brown
Neutral	– light blue
Earth	– yellow/greeen

The mains fuse is readily accessible at the rear of the instrument. The one fitted in the instrument on delivery is rated at 250mA and is correct for 230V operation. For 115V mains operation this fuse should be replaced by one rated at 500mA. When alternative mains operation is required, the small plate at the rear of the unit should be removed and the switch reset appropriately. The cover plate should be reversed before replacement accordingly.

Output is taken from the type 6590 Power Supply via a BNC socket on the front of the unit. The centre pin is negative. The positive outer is connected to earth via the case and mains lead.

The printed wiring board may be removed by detaching the push-on connectors and removing the fixing screws. The output transistor may be detached by removing the two retaining screws and drawing the transistor off the heat sink. Silicone grease should be applied to the mounting surface of a replacement transistor.

CAUTION On no account should the heat-sink be removed from the back plate as this will damage the intervening material which acts as a thermal and electrical insulator as well as a means of fixing.

Chapter 4

Replaceable parts

4.1. INTRODUCTION

This chapter lists replaceable parts in order of circuit references. The following abbreviations and symbols are used:

BNC	:	bayonet-lock coaxial connectors	VT	:	transistor
C	:	capacitor	WW	:	wirewound
FS	:	fuse	ZD	:	zener diode
ILP	:	indicator lamp	f.s.d.	:	full scale deflection
Lin.	:	linear	μF	:	microfarad
Min.	:	miniature	V	:	volt
MR	:	semiconductor diode	W	:	watt
R	:	resistor	pF	:	picofarad
RV	:	resistor variable	Ω	:	ohms
SW	:	switch	kΩ	:	kilohm
SK	:	socket	MΩ	:	megohm
T	:	transformer	mA	:	milliampere

*NOTE: MR also appears as a manufacturer's part number to which the above abbreviation does not apply.

ORDERING

Send your order for replacement parts to our Service Department. Specify the following information for each part required.

(1) Type and serial number of instrument
(2) Circuit reference
(3) Description

For TECHNICAL SERVICE DEPARTMENT ADDRESS
(see back cover)

4.2 REPLACEABLE PARTS

REFERENCE	DESCRIPTION	RATING	TOLERANCE	MANUFACTURER	PART NUMBER
CAPACITORS					
C1	0.047μF	250V	±20%	Mullard	C280AE SERIES
C3	0.1μF	250V	±10%	Mullard	344–41104
C4	0.001μF	250V	±10%	Mullard	C296 AC/A1K
C5	0.0015μF	350V	±1%	Lemco	Silver mica MR2515
C6	0.0015μF	350V	±1%	Lemco	Silver mica MR2515
C7	800μF	64V		Mullard	C431 BR/H800
C8	800μF	64V		Mullard	C431 BR/H800
DIODES					
MR1	Diode Silicon			Texas Instruments	1S920
MR2	Diode Silicon			Texas Instruments	1S920
MR3	Diode Silicon			Texas Instruments	1S920
MR4	Diode Silicon			Mullard	BYX36–300
MR5	Diode Silicon			Mullard	BYX36–300
MR6	Diode Silicon			Texas Instruments	1S920
ZD1	Zener Diode			Mullard	BZY88/C5V6
ZD2	Zener Diode			Mullard	BZY88/C5V6
ZD3	Zener Diode			Mullard	BZY88/C5V6
ZD4	Zener Diode			Mullard	BZY88/C5V6
FUSE					
FS1	Fuse (20mm x 5mm) glass	250mA			
INDICATOR LAMP					
ILP1	Indicator Lamp	24V 20mA		Thorn	SGF9/A/RED/24
METER					
M1	Meter 1mA f.s.d.			Sangamo Weston	A3838/019 (M.I.S.D.)
RESISTORS					
R1	Resistor Fixed 820Ω	¼W	±2%	Welwyn Metox	MR4
R2	Resistor Fixed 820Ω	¼W	±2%	Welwyn Metox	MR4
R3	Resistor Fixed 2.7kΩ	¼W	±2%	Welwyn Metox	MR4
R4	Resistor Fixed 2.2kΩ	¼W	±2%	Welwyn Metox	MR4
R5	Resistor Fixed 820Ω	¼W	±2%	Welwyn Metox	MR4
R6	Resistor Fixed 2.7kΩ	¼W	±2%	Welwyn Metox	MR4
R7	Resistor Fixed 4.7kΩ	¼W	±5%	Welwyn Metox	MR4
R8	Resistor Fixed 100kΩ	¼W	±5%	Welwyn Metox	MR4
R9	Resistor Fixed 100Ω	¼W	±5%	Welwyn Metox	MR4
R10	Resistor Fixed 4.7kΩ	¼W	±5%	Welwyn Metox	MR4
R11	Resistor Fixed 180Ω	¼W	±2%	Welwyn Metox	MR4
R12	Resistor Fixed 1kΩ	1W	±5%	Welwyn Metox	MR6
R13	Resistor Fixed 68kΩ	¼W	±5%	Welwyn Metox	MR4
R14	Resistor Fixed 6.8kΩ	¼W	±5%	Welwyn Metox	MR4
R15	Resistor Fixed 22kΩ	¼W	±2%	Welwyn Metox	MR4
R16	Resistor Fixed 820kΩ	½W	±2%	Welwyn Metox	MR5
R18	Resistor Fixed 470kΩ	½W	±2%	Welwyn Metox	MR5
R19	Resistor Fixed 47kΩ	¼W	±2%	Welwyn Metox	MR4

REFERENCE	DESCRIPTION	RATING	TOLERANCE	MANUFACTURER	PART NUMBER
RESISTORS					
R20	Resistor Fixed 47kΩ	¼W	±2%	Welwyn Metox	MR4
R21	Resistor Fixed 150kΩ	¼W	±2%	Welwyn Metox	MR4
R22	Resistor Fixed 150kΩ	¼W	±2%	Welwyn Metox	MR4
R23	Resistor Fixed 33kΩ	¼W	±2%	Welwyn Metox	MR4
R24	Resistor Fixed 33kΩ	¼W	±2%	Welwyn Metox	MR4
R25	Resistor Fixed 33kΩ	¼W	±2%	Welwyn Metox	MR4
R26	Resistor Fixed 4.7Ω	5W	±1%	Welwyn Metox	W21
R27	Resistor Fixed 3.9MΩ	¼W	±2%	Welwyn Metox	C21
R28	Resistor Fixed 470Ω	½W	±10%	Radiospares	Moulded Carbon
R29	Resistor Fixed 1kΩ	¼W	±1%	Welwyn Metox	MR4
R30	Resistor Fixed 150Ω	¼W	±2%	Welwyn Metox	MR4
R31	Resistor Fixed 8.2kΩ	¼W	±2%	Welwyn Metox	MR4
R32	Resistor Fixed 18kΩ	¼W	±1%	Welwyn Metox	MR4
R33	Resistor Fixed 130kΩ	¼W	±2%	Welwyn Metox	MR4
R34	Resistor Fixed 6.8kΩ	¼W	±1%	Welwyn Metox	MR4
R35	Resistor Fixed 100kΩ	1/8W	±5%	Mullard	CR25
R36	Resistor Fixed 1.5kΩ	3/8W	±5%	Mullard	CR25
R37	Resistor Fixed 4.7Ω	3/8W	±5%	Mullard	CR25
R38	Resistor Fixed 15kΩ	1/8W	±5%	Mullard	CR25
RESISTORS VARIABLE					
RV1	Resistor Variable 1kΩ	1W	Lin WW	Colvern	CLR 1106/19
RV2	Resistor Variable 5kΩ		Lin	Welwyn	P25
RV3	Resistor Variable 100kΩ	¼W	Lin	Morganite	U
TRANSFORMER					
T1	Mains Transformer			(M.I.S.D.)	B3510/T/530
TRANSISTORS					
VT1	Transistor Silicon			S.G.S.	C424
VT2	Transistor Silicon			Mullard	BCY30
VT3	Transistor Silicon			S.G.S.	C424
VT4	Transistor Silicon			S.G.S.	C424
VT5	Transistor Silicon			Mullard	BCY30
VT6	Transistor Silicon			S.G.S.	C424
VT7	Transistor Silicon			Texas Instruments	2S033
VT8	Transistor Silicon			S.G.S.	V435
VT9	Transistor Silicon			S.G.S.	C424
VT10	Transistor Silicon			S.G.S.	V435
VT11	Transistor Silicon			S.G.S.	V435
VT12	Transistor Silicon			S.G.S.	C424

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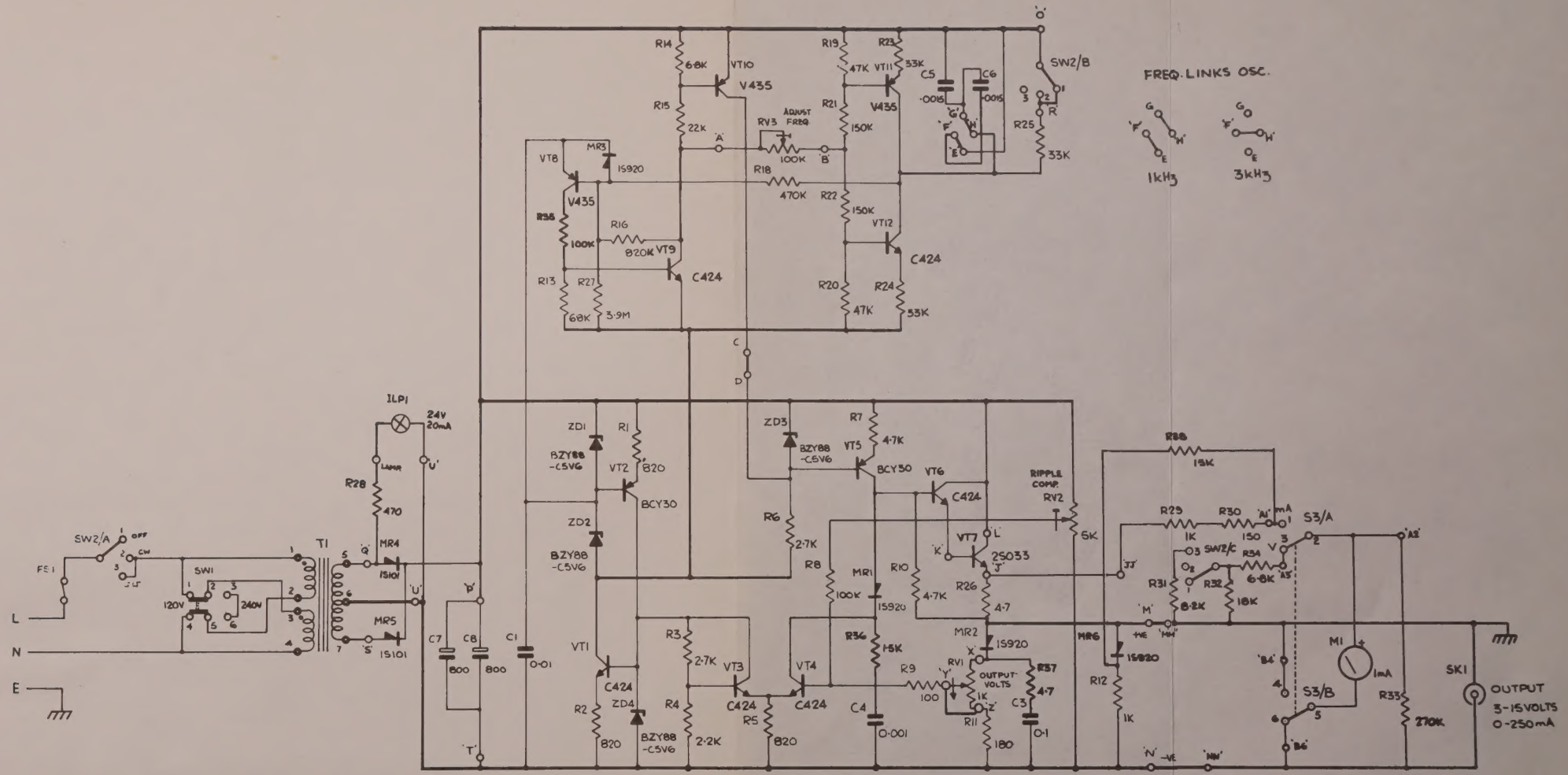

TYPE 6590 POWER SUPPLY CIRCUIT DIAGRAM

Fig 2.

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